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Development of Nachos using Moringa Oleifera (Drumstick), Zea Mays (Maize) Flour, Chenopodium Quinoa (Quinoa) Flour, and Oryza Sativa (Rice) Flour

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ABSTRACT

The Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara, Gujarat, conducted the nachos study. This study demonstrates the health advantages of drumsticks, and its main objective is to create nachos that can be enjoyed by people of all ages using the same ingredients. Drumsticks contain a lot of vitamins and have antioxidant effects. For the creation of Nachos, three formulations with a control sample were created. Drumsticks were used to make nachos, they were first boiled, then chopped up, blended into a paste, and then added to boiling water with salt, baking soda, quinoa flour, and rice flour. Garlic powder, black pepper powder, and spices like chili powder for improved taste and flavor, nachos were additionally seasoned with onion powder, chat masala, and mix herbs. During the creation of the dough, different amounts of drumstick paste (20%, 30%, and 40%) were added. The dough was first made into tortillas, and then it was further fried. To manufacture nachos, different formulations were prepared. The developed nachos underwent additional testing for microbiological analysis, physio-chemical characteristics, and sensory evaluation. The nachos had an energy value of 534.27kcal, 2.08% moisture content, 4.84% ash content, 6.91% protein content, 53.78% carbs content, and 2.08% fat content.

KEYWORDS: *Drumsticks, Maize flour, Quinoa flour, Rice flour*

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1. INTRODUCTION

Tortilla chips are a very important part of the U.S. snacks food market and are becoming popular in Europe, Australia, Asia and Southeast Asia. They are made from ground masa, produced from alkaline cooked whole kernel corn or alternatively from dry mass flour. The mass is sheeted into thin layers that are cut into small pieces typically triangular or round. The pieces then are fried into crunchy chips. Tortilla chips are eaten as snacks, with or without salsa, as nachos, or as a part of main meal. Their consumption has increased in recent years. Because of the high levels of carbohydrates, protein, and fats in this snack, it has good sensory and nutritional qualities. While defining and creating public health recommendations for health promotion, it is important to keep in mind the influences that social, cultural, environmental, and economic factors have on the balance between health and sickness. (Snack Foods Processing, Edited by Raymond W. Lusas, Llyod W. Rooney).

The plant is the medium-sized tree belonging to the Moringaceae. The family consist of the single genus Moringa, and the botanical name of the tree is Moringa Oleifera. (C.Ramachandran, K.V.Peter and P.K Gopalakrishnan Jul-sept, 1980)

M.oleifera is a rich source of potassium, calcium, phosphorus, iron, vitamin A, D and C, essential amino acids as well known antioxidants such as beta-carotene and flavonoids. (S.Yegambal and A Swarnalatha 2019)

In all cooking methods, sauteing resulted in higher retention of B-carotene, iron, calcium and antinutritional factors. In immature drumstick pods. In wet cooking methods, both microwave cooking and pressure cooking were found to preserve more nutrients in immature drumstick pods than boiling and blanching. (Kavita Kachhawa, Parmjit Chawla May 9 2022)

Quinoa unlike wheat, rye, barley, does not contain gluten thus can serve as is important alternative to traditional cereals, for people suffering from celiac disease. Quinoa is a pseudo-cereal and belongs to the genus Chenopodium (chenopodiacae family). It is an ideal grain whose protein profile resembles that of milk with the added advantage of being high in essential fatty acids and fibre. Quinoa is a very rich source of some important minerals like calcium, magnesium, iron, and zinc quinoa is being used in the product like bread, chips, pan cake, and cookies and gaining consumer acceptance worldwide. (Nidhi Chopra, Bhavnita Dhillon, Rupa Rani, Arashdeep Singg 2018)

Maize or corn (zea mays L.) Belonging to family poaceae is known as an important annual cereal crop of the world. Maize kernel is an edible and nutritive part of the plant which contains Vitamin C, Vitamin E, Vitamin K l, Vitamin (thiamine) B1, Vitamin (niacin) B2, Vitamin (riboflavin)B3, Vitamin B5 and Vitamin B6, folic acid, selenium, and tryptamine. Potassium is a major nutrient present which has a good significance because an average human diet is deficient in it. (Tajamul Rouf shah, Kamlesh Prasad and Pradyuman Kumar 2016)

The rice flours and starches are important ingredients in both traditional and novel foods prepared across the world. Absence of gluten provides on additional advantage and makes rice flour particularly suitable as an alternative to wheat in bakery products especially suitable for persons suffering from physiologically disorder of gluten sensitive enteropathy. (K Prasao, Y, singh, A Anil 2012)

2. MATERIALS AND METHODS

The Department of Food Technology, Parul Institute of Applied Science, Parul University, Vadodara, conducted the current study, which is named "Development Drumstick Nachos." This section details the materials utilised as well as the processing methods, organoleptic assessments, and analytical processes employed throughout the investigation.

2.1. Materials

A. Raw materials used in studies

Drumstick pulp, Quinoa flour, Maize flour, Rice flour, and spices such as garlic powder, black pepper powder, chilli powder, onion powder, chat masala, and mix herbs were used to make nachos. These items were purchased from a local Vadodara market**.**

B. Processing Equipment

Weighing scale, grinder, spatula, bowl, cauldron, frying spoon, and other items were acquired from the food processing lab of the department of food technology at the Parul Institute of Applied Sciences, Parul University, Vadodara, where nachos are prepared.

2.2. Methods

A. Physio-chemical Analysis

Drumstick pulp, Quinoa flour, Rice flour, Maize flour, Spices like Garlic powder, black pepper powder, chili powder, onion powder, chat masala, and mix herbs were used to prepared Nachos were analysed for proximate composition including moisture, ash, protein, fat, carbohydrate, antioxidants and calories content as per the standard procedure given by (AOAC 2005)

a. Moisture content

Moisture content was estimated by drying the empty dish and 10g of sample was weighed and grounded in the dish. The dish was then subjected to oven for drying at 135^0C for 2hrs. It was again weighed after cooling in desiccator until constant weight. The resultant loss in weight was calculated as moisture content.

Moisture % = Initial weight (W1)-final weight (W2) / Initial weight (W1) × 100

b. Ash content

Ash content was determined using (AOAC 2005) procedure. 5g of sample was weighed into pre-weighed crucible and it was heated at low flame till all the material was completely charred (smokeless) and cooled. The sample was then kept in the muffle furnace for about 2hrs, at 700^0C. It was cooled in desiccator and weight of a sample was taken. The procedure was repeated until two consecutive weights were constant. The percent ash was calculated by knowing the difference between the initial and final weight.

Ash %=Weight before heating – Weight after heating/ weight of sample × 100

3. Determination of Protein Carbohydrates and Fats:

The results are Protein was 6.91%, Carbohydrate was 53.78%, and Fat was 32.39%

B. Microbial Parameter

The microbial quality of prepared Nachos was determined. In the present study different microbial parameters such as Total Plate Count, Yeast and Mould were examined also the samples were examined during the storage at ambient temperature.

a. Determination of Total Plate Count

- Preparation of nutrient agar medium: 25g of nutrient agar was added in 550ml of distilled water and it was heated till it dissolved properly. Its mouth was plugged with cotton and it was sterilized in an autoclave for 20min at 121° C

- Preparation of sample solution (serial dilution): Four sterilized test tubes were taken and numbered. In each tube 9ml of distilled water was poured. The test tubes were plugged with cotton plugs and were sterilized in an autoclave at 121°C for 15min. In 9 ml distilled water of sterile test tube 1 ml of sample was added serially
- Preparation of plates: Petri plates and pipettes were sterilized by hot air oven (dry heat treatment) or by autoclave (moist heat treatment). Sterilized petri dishes were taken to the laminar airflow cabinet and ultraviolet light was switched on for 30min. After 30min UV light was switched off and then blower was switched on, and the working surface was cleaned by 70% 1ml sample was poured into the plates and marked. 15-20ml of molten media was poured into each plate. This was done near a flame to prevent contamination of the plate by microbes. The Plates were kept for the solidification after swirling. The plates were then placed into the incubator for 48hrs at 37° C and then observed for the colonies on the plates.

b. Determination of Yeast and Mould

- Preparation of potato dextrose agar medium: 11g of Potato dextrose agar medium was added in 250ml of distilled water and it was heated to dissolve properly. Using cotton plug the mouth was plugged and it was sterilized in an autoclave at 121° C for 15min.
- Preparation of sample solution (serial dilution): 4 sterilized test tube were taken and numbered accordingly. 9ml distilled water was poured in each tube. The test tubes were closed with cotton plugs and were sterilized inn an autoclave at 121°C for 15min. 1ml of sample was added in 9ml distilled water of sterile test tube serially.
- Preparation of plates: Petri plates and pipettes were sterilized in hot air oven (dry heat treatment) or by autoclave (moist heat treatment). Sterilized petri dishes were taken to laminar air flow cabinet and ultraviolet light was switched on for 30min. After 30min UV light was switched off and then blower was switched on, and the working surface was cleaned by 70% alcohol. Plates were properly marked and then 1ml of samples were poured into the plates. 15-20ml of molten media was poured into each plate. This was done near a flame to prevent the contamination of the plate by microbes. The Plates were kept for the solidification after swirling. Then the plates were kept into the incubator for 48hrs at 37°C and the colonies were observed on the plates. The former colonies were counted on the plate.

4. Preparation of Nachos

Table 4.1: Formulation of Nachos

Formulation	Drumstick pulp (%)	Quinoa flour (%)	Maize flour (%)	Rice Flour (%)
C1	20	20	30	30
C2	30	20	30	20
C3	40	20	20	20

The various ingredients used for the standardization of recipe for the preparation of Drumstick pulp nachos consist of 100gm. Nachos were prepared in three formulations C1: C2: C3. The amount (in grams) of C1 Formulation was 20g of Drumstick pulp, 20g of Quinoa Flour, 30g Maize Flour, 30g Rice Flour. C2 Formulation was 30g of Drumstick pulp, 20g of Quinoa Flour, 30g Maize Flour, 20g Rice Flour. C3 Formulation was 40g of Drumstick pulp, 20g of Quinoa Flour, 20g Maize Flour, 20g Rice Flour. 4-5g of spices like chilli powder, pinch of salt, ginger powder, garlic powder, white onion powder, black pepper powder, chat masala and mixed herbs. The above ingredient required for making 3 formulations weight 100g to 120g. Quinoa flour was used as binding in dough preparation. The dry spices were added for taste. The dough was prepared by adding all the ingredients above, then mixing it with boiling water. After the preparation of dough, it was rolled into a thin sheet and cut into triangular shapes and fried at 120°C for 5 minutes. The Fried Nachos was kept in Parchment paper to remove excess of oil. All spices were added as a seasoning after frying. The Prepared Nachos was kept in Low Density Polyethylene (LDPE) Zip bags. Nachos can be stored at normal room temperature for shelf-life.

5. RESULT AND DISCUSSION

Figure 1: Developed Nachos

The result obtained during the investigation "Development of Nachos using Drumstick pulp" is discussed here. The final product was analysed for physio-chemical analysis, microbial-analysis sensory evaluation and stored at room temperature. Research experiments undertaken to standardized the method for manufacturing of Drumstick Nachos have been discussed under heading.

Table 5.1.1: Proximate composition of Nachos

Characteristics	Values (%)
Moisture content	2.08%
Ash content	4.84%
Protein	6.91%
Carbohydrate	53.78%
Fat	32.39%
Calorific value (%)	534.27 Kcal

The moisture content in Nachos was 2.08%. Ash content was 4.84%, Protein 6.91%, Carbohydrate was 53.78%, Fat was 32.39% and calories found was 534.27 Kcal

Microbial analysis of Nachos

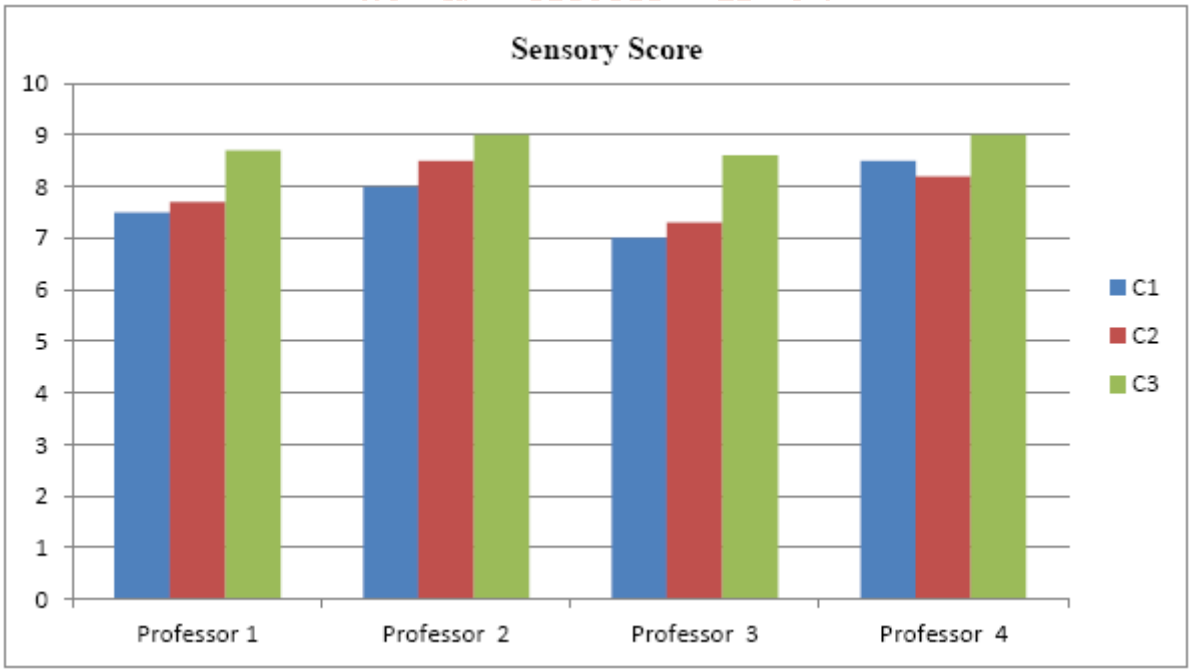
- **Total plate count (TPC) of Nachos:** The mean values for TPC of Nachos samples was found to be <10
- **Total yeast and mould count of Nachos:** The mean values for mould count of Nachos sample was found to be <10.

Table 5.1.2: Sensory evaluation of produced Nachos

Sample code	C1	C2	C3
Appearance	7.75	8.25	8.37
Color	7.25	7.56	7.93
Texture	7.5	7.5	8.31
Taste	7.12	7.62	8.06
Overall Acceptability	7.405	7.73	8.16

The taste, flavour, and texture of the nachos had a big impact on their quality. Due to variations in the percentage of rice flour, quinoa flour, maize flour, and drumstick pulp, the texture and flavour of nachos changed significantly. According to a 9-point hedonic scale, the nachos with C1 formulation received a 7.75 hedonic score for appearance, a 7.25 hedonic score for colour, a 7.5 hedonic score for texture, and a 7.12 hedonic score for flavour and its overall acceptability was 7.40, This implies that the nachos are liked considerably. It could be as a result of the bland flavour, poor texture, look, or flavour. C2 formulation received hedonic scores of 8.25 for appearance, 7.56 for colour, 7.5 for texture, and 7.62 for taste. The nachos with C2 formulation received a 7.73 rating for overall acceptability, which is a strong recommendation. The C3 formulation received hedonic scores of 8.37 for appearance, 7.93 for colour, 8.31 for texture, and 8.06 for taste. The C3 formulation of the nachos received a score of 8.16 for overall acceptability, indicating that they are Liked extremely. Thus, the finest nachos were those made with the C3 formulation.

Table 5.1.3: Hedonic Scale



Packaging and Storage

The Nachos were packed in Low Density Poly-Ethylene (LDPE) bags and can be stored in room temperature for 3 to 4 months.

Table 5.5 Cost Estimation of per 100g Nachos

Ingredients	Grams	Cost (Rs.)
Drumstick Pulp	40g	10/-
Quinoa Flour	20g	10/-
Maize Flour	20g	3/-
Rice Flour	20g	2/-
Spices	5g	5/-
TOTAL	**100g**	**30/-**

6. Conclusion

The developed Nachos with composition C3 were conclude to be the best developed product out of 3 formulations, according to the research mentioned above. Hence, the C3 formulation underwent additional physio-chemical, microbial, and sensory analysis. After sensory analysis, it was determined that the nachos were gluten-free and widely liked. The energy value is 534.27 kcal, moisture content is 2.08%, ash content is 4.84%, protein content is 6.91%, carbohydrate content is 53.78%, and fat content is 2.08% were the Physio-Chemicals parameters that were determined. The developed nachos can be consumed by people with celiac disease and can be enjoyed by people of all ages because they are gluten-free.

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